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Line Passing "Torpedo" For Use Under Sea Ice;
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EXPOSURE

vol.9 no.2 a newsletter for ocean technologists

Line Passing "Torpedo" For Use Under Sea Ice

FIGURE 1

For a variety of deployment and recovery tasks, it is essential to pass ropes and wires under the Arctic sea ice. The technical staff of the Frozen Sea Research Group developed an under ice line passing "torpedo" which has, for the last two years, performed very well during winter field operations. Figure 1 shows the torpedo complete with launch pole being readied for deployment.

Description

The torpedo is 120 cm overall length, approximately 20 cm in diameter, and weighs 40 lb in air and 21 lb in water. A 30-cm-diameter hole is required through the ice to deploy the torpedo and subsurface float (see Figure 2). The torpedo is hung on a single rope approximately 2 meters below the float. This subsurface float bounces along the underside of the sea ice and, having about 15 to 20 lb excess buoyancy, supports the torpedo. Attached to the rear steering bridle are two main power wires which are 35 m long. The electric drive motor was a 48 V dc, counter-rotating torpedo motor which was rewound for 12 V dc. Due to line loss, it is necessary to start with three 12-V, heavy duty lead acid batteries, in series on the surface, to get the required power to the motor. As the torpedo operates in a cold marine environment, heat dissipation is no problem.

May 1981

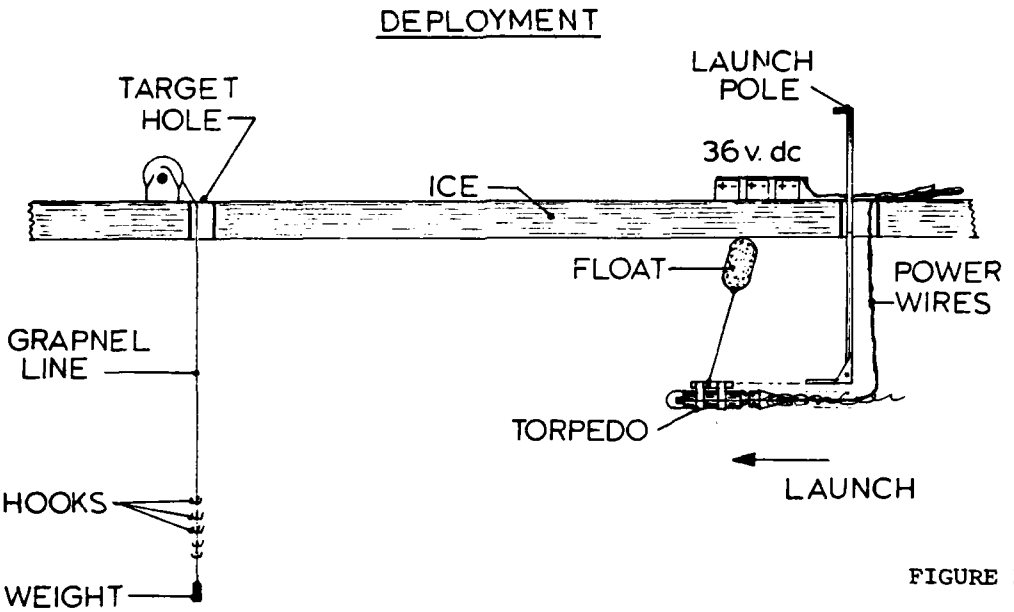


FIGURE 2

Operation

Before launching the torpedo, two 30-cm-diameter holes are drilled in the desired direction and distance apart. A 20-m grapnel line, having five or six treble 3-inch fish hooks, spaced approximately 30 cm apart and weighted with a 1-lb lead weight on its lower end, is deployed down the target hole. When aiming at the target hole, the torpedo is launched from its deployment hole at an azimuth angle of approximately 20° to the left of the desired target (Figure 3). When the torpedo reaches the length of the desired run, the power wires are tethered and the power to the motor is reversed. This reversing of electrical power does not affect the direction of the motor and so it continues to drive, maintaining tension on the tethered power wires. This reversal of current causes a diode-controlled solonoid on the front of the

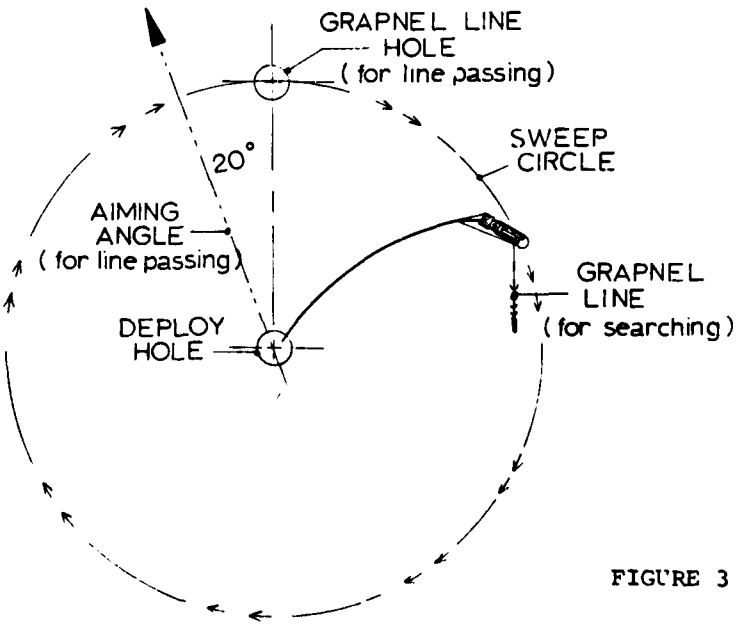


FIGURE 3

pressure case housing to trip, allowing the steering bridle to offset to the right of the case (see Figure 4). This offset, in conjunction with power still being applied to the propellors, allows the torpedo to sweep to the right in a large circle (see Figure 3). When the tether wires cross the grapnel line (previously deployed through the target hole), the power is shut off and the torpedo pulled back by its power wires to and through the deployment hole, thus pulling the grapnel line with it (see Figure 5). Another hole is then drilled and the process repeated until the desired distance has been reached. Both ends of the rope are then joined together to form a continuous loop above and below the ice. This loop is then used to pass lines, etc., under the ice from hole to hole. The torpedo is removed, washed, and stored away. As local current speed and direction may play a significant role in the

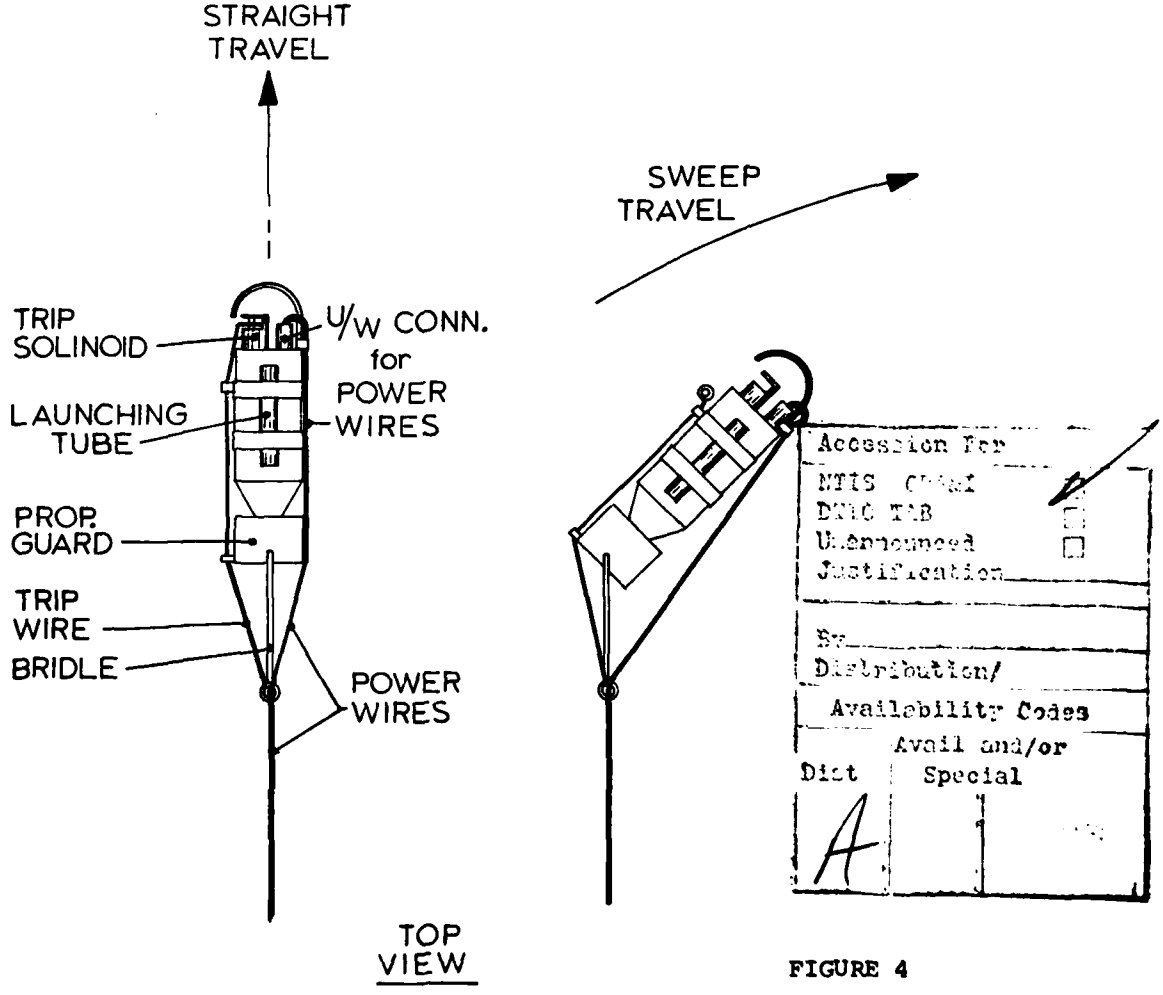
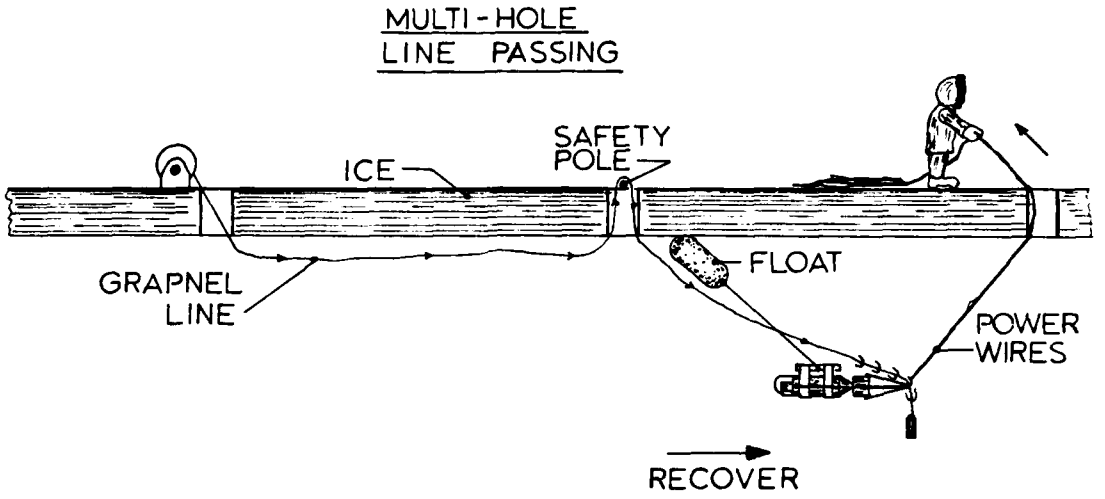


FIGURE 4



successful deployment, aiming, sweeping, and recovery of the torpedo, it is desired to identify these parameters before launching and to use them to your advantage where possible.

Other Uses

The torpedo is useful for sampling under the ice or sweeping up to 70-m-diameter circles when searching for lost equipment. It can also be used to deploy drag lines.

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Dennis Richards has been a member of the Frozen Sea Research Group for the past 11 years, working primarily in the Canadian High Arctic. A machinist by trade, his primary function is the design and building of electro/mechanical equipment for the group.

Syd. Moorhouse is a senior logistics and design technologist with the Frozen Sea Research Group. He has spent 17 years in the Canadian High Arctic, involved with the designing, development, and installations of instrumented data collection systems.

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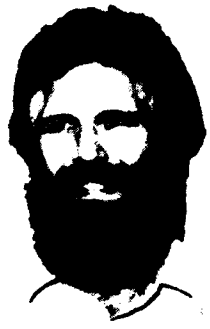
The following is a list of recent books and reports for ocean technologists and instrumentation system designers. They cover the physics, sensor technology, amplifier design, data transmission, signal analysis, and computer programming necessary for marine instrumentation systems. They are more practical than theoretical. I have found the majority of these books to be the most useful ones in their fields. Items with an * are especially recommended.



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